

### **REMARKS**

Claims 15, 17-19, and 25 have been amended. Claims 23 and 24 have been cancelled. New claims 28-37 have been added. Claims 1-14, 16, 21, and 22 were cancelled in previous submissions. Claims 15, 17-20, and 25-37 are presented for the Examiner's review and consideration. Applicant believes that the amendments and accompanying remarks herein serve to clarify the present invention and are independent of patentability. No new matter has been added.

#### **Amendments to the Claims**

No new matter has been added by the amendments to claim 15 made herein. This claim has been amended to clarify several characteristics of the chamber of the claimed apparatus; the chamber is substantially enclosed, has a negative pressure, includes a produce inlet, and a produce outlet. This concept is supported by the specification as originally filed. *See* paragraphs [0010] and [0026]; and the Figure of the published application, U.S. Patent Application Publication 2007/0261570 A1; hereinafter "published application." This claim has also been amended to clarify that the chamber of the claimed apparatus includes at least two conveyor belts that are vertically spaced apart and horizontally positioned relative to each other so that one end of the upper conveyor belt overhangs the lower conveyor belt such that produce is moved along the upper belt and dropped to the lower belt to be fully exposed to the free radical saturated atmosphere prior to exit from the chamber. This concept is also supported by the specification as originally filed. *See* paragraphs [0010]; [0011]; [0028]; and [0029] and the Figure of the published application.

No new matter has been added by the amendments to claims 17-19 made herein. These claims were amended only to correct inadvertent typographical errors; for consistency of language; and/or to provide antecedent basis for all terms recited therein.

No new matter has been added by the amendments to claim 25 made herein. This claim has been amended in light of the cancellation of claim 24 and to correct an inadvertent typographical error.

No new matter has been added by the addition of claim 28 made herein. This claim has been added to encompass subject matter deleted from claim 15 (“means for catalysing breakdown of ozone include a coating on an interior of the chamber, the coating having one or more ozone catalysing materials”).

No new matter has been added by the addition of claim 29 made herein. This claim incorporates the subject matter of cancelled claim 23.

No new matter has been added by the addition of claim 30. This claim combines the subject matter of claim 15 (as amended herein) and claims 17-19 in independent form. Additionally, this claim clarifies the positioning of the spacing and location of the first and second sprayheads within the chamber; *i.e.* along the flow path of the produce through the apparatus. *See* paragraphs [0011] and [0013] and the Figure of the published application.

No new matter has been added by the addition of claim 31 made herein. This claim has been added to further clarify the positioning and location of the first and second sprayheads within the chamber. The first and second sprayheads are provided in a constant spacing above the first and second conveyor belts and are provided on at least two sides of the conveyor belt in the portion of the pathway in which the upper conveyor belt delivers produce to the lower conveyor belt. *See* paragraph [0013] and the Figure of the published application.

No new matter has been added by the addition of claims 32-37 made herein. These claims incorporate subject matter of original claims 20, 23, and 25-28 and are written for dependency on new independent claim 30.

#### Rejections under 35 U.S.C. §103(a)

Claims 15, 17-20, 26, and 27 were rejected under 35 USC §103(a) as allegedly being unpatentable over Frank A. Eldredge et al. (International Publication WO 01/78793 A1; hereinafter “Eldredge”) in view of the “SpringerLink Journal Article” (L.E. Eary, *Metallurgical and Materials Transactions B*, 16(2):181-186, 1985; hereinafter “Eary”), and further in view of Richard S. Potember et al. (U.S. Patent Application Publication 2004/0120845 A1; hereinafter

“Potember”).

Claim 23 was rejected under 35 USC §103(a) as allegedly being unpatentable over Eldredge in view of Eary, and further in view of “CSA Illumina” (N. Singh et al., Air & Waste Management Association, Pittsburg, PA 15222, 1997; hereinafter “Singh”).

Claims 24 and 25 were rejected under 35 USC §103(a) as allegedly being unpatentable over Eldredge in view of Eary, and further in view of Volker Kamm (U.S. Patent 6,725,674 B1; hereinafter “Kamm”).

For reasons set forth below, Applicant respectfully submits that these rejections should be withdrawn.

It is noted that the references are described individually only to clarify what each reference teaches. Thus, presentation of individual descriptions (of the references) is not and should not be interpreted as an attempt “to argue the references separately.”

#### Eldredge

Eldredge discloses an apparatus and method for producing a sterilizing agent containing hydrogen peroxide, singlet oxygen, oxygen ions, ozone, and hydroxyls. *See* abstract; page 1, lines 2-6; and page 8, line 24-page 9, line 2. The apparatus and method can be used for sterilization of air, liquids, and/or surfaces. *See* abstract and page 22, lines 18-20. The apparatus for producing the sterilizing agent includes an oxygen concentrator that creates a supply of O<sub>2</sub> from the air; an ozone generator that makes O<sub>3</sub> from the supply of O<sub>2</sub>; a moisture control device that regulates the humidity or moisture in the supply of O<sub>2</sub>/O<sub>3</sub> mixture; an ultraviolet (UV) light that generates UV light in the presence of O<sub>3</sub> and moisture; and a contact chamber. Living matter is rendered non-viable through contact with the sterilizing agent in the contact chamber. *See* abstract and page 8, lines 6-16. In the method of sterilization using the apparatus, a sterilant gas is formed by concentration of oxygen, generating ozone from the oxygen, humidifying the mixture of oxygen and ozone, irradiating the humidified mixture of oxygen and ozone with UV light to form a sterilant. *See* abstract and Fig. 1A. The apparatus/method can be used in an agricultural product storage device. *See* page 9, lines 11-17; page 28, line 15-page 29, line 19;

and Fig. 4.

#### Eary

Eary describes the decomposition of hydrogen peroxide in acidic solutions (sulfuric acid) catalyzed by free ferric ion ( $\text{Fe}^{3+}$ ). Eary examined the rates of this reaction to optimize solutions used for leaching uranium deposits. *See abstract and Introduction.*

#### Potember

Potember discloses an apparatus for neutralizing airborne pathogens in ventilated air (heating/air conditioning systems). *See abstract and paragraphs [0003]; [0012]; and [0013].* The apparatus includes a flow-through reaction chamber, an ozone generator, a water supply line, and an ultraviolet light source. The chamber has an air inlet at one end, an air outlet at a second end, and a passageway for the flow of air therebetween. The ozone generator, water supply line, and ultraviolet light source are located within the chamber. *See abstract; paragraphs [0011]; [0014]; [0016]; [0025]; and [0042]; and Figure 1.* In use, highly reactive ozone intermediates are formed by reacting ozone with water in the presence of ultraviolet light. These intermediates react with pathogens in the air to neutralize them. *See abstract; paragraphs [0013]; [0018]; and [0024]; and Figure 3.* The apparatus can further include a porous matrix to increase the surface area on which the neutralization of pathogens can occur and/or a solid support coated with ozone removal catalysts to prevent ozone escape from the chamber. *See paragraphs [0014]; [0016]; [0042]; [0052]-[0055]; and [0065]-[0068]; and Figure 1.* Additionally, Potember discloses a second embodiment of the apparatus including an external mixing chamber connected to an external water reservoir and an external ozone generator for producing a mixture of ozone and water that is then introduced as a mist into the flow-through chamber. *See paragraphs [0014]; [0017]; [0044]; and [0045]; Figure 2; and Example 1.* Potember discloses a method for installation of the apparatus in a ventilated air system. *See paragraphs [0077]-[0084].* Further Potember discloses a method for neutralizing pathogens in air using the apparatus. The steps of this method include: a) directing circulating air contaminated with pathogens into the chamber;

b) introducing water vapor or water droplets into the chamber; c) introducing ozone into the chamber; d) irradiating the air, water vapor/droplets, and ozone with ultraviolet light; and e) passing the neutralized air out of the chamber. *See* abstract and paragraphs [0013]; [0022]; and [0069]-[0076].

#### Singh

Singh discusses the toxicity of ozone and the application of a manganese dioxide catalyst to decompose ozone at ambient temperatures. *See* abstract.

#### Kamm

Kamm discloses a device and method for cryogenic freezing of materials, such as foodstuffs, which requires limited floor space. In use, material is exposed to a cryogenic coolant while being moved up and down through a housing including two towers. The materials are moved via a paternoster conveying system having vertical circulating conveyor belt. *See* abstract; column 1, lines 5-12, 30-40; and column 4, lines 38-45.

#### Instant Invention

The instant invention, as currently claimed in independent claims 15 and 30, provides a produce decontamination apparatus having a substantially enclosed chamber for accepting produce to be decontaminated and/or sterilized. The chamber has a negative pressure and includes a produce inlet and a produce outlet. The apparatus includes means for producing a free radical saturated atmosphere within the chamber so that, in use, the free radical saturated atmosphere decontaminates and/or sterilizes the produce, the means for producing a free radical saturated atmosphere including one or more first atomizing sprayheads, a supply of ozonized liquid which is supplied to the first sprayheads, and means for breaking down an ozone forming part of the ozonized liquid once discharged from the first sprayheads. The means for breaking down an ozone forming part of the ozonized liquid can be an ultraviolet emitting device (claim 30). The chamber includes at least two conveyor belts that are vertically spaced apart and

horizontally positioned relative to each other so that one end of an upper conveyor belt overhangs a lower conveyor belt. In operation, produce is moved along the upper belt and dropped to the lower belt to be fully exposed to the free radical saturated atmosphere prior to exit from the chamber. The apparatus can also include second sprayheads which emit a catalyzing liquid for breaking down hydrogen peroxide formed from reaction of the ozone forming part of the ozonised liquid and ultraviolet light emitted from the ultraviolet emitting device (claim 30). The invention also provides methods for decontamination of produce using the apparatus and produce decontaminated by the apparatus. *See* abstract; paragraphs [0006]-[0008]; [0010]; [0011]; [0013]; [0023]; [0026]; [0028]; and [0029]; and the Figure of the published application.

#### Argument

Applicant respectfully submits that the invention, as currently claimed, is not obviated by any combination of Eldredge and Eary with Potember, Singh, and/or Kamm.

As noted above, independent claims 15 and 30 recite, *inter alia*, a produce decontamination apparatus having a substantially enclosed chamber for accepting produce which is maintained at a negative pressure, an arrangement of sprayheads for creating the free radical saturated atmosphere and breakdown of reactants produced providing further free radical saturation, and a unique arrangement of conveyor belts which create a flow path for the produce wherein all surfaces (of the produce) can be in contact with the free radical saturated atmosphere within the chamber.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Therefore, in order for an Examiner to properly establish a *prima facie* case of obviousness, the Examiner first must show that all the elements of the claimed invention are known or suggested in the prior art.

The Examiner asserts that Eldredge discloses the invention with the exception of means for breaking down ozone and vertically spaced conveyor belts.

Applicant respectfully disagrees and submits that the apparatus of Eldredge is not akin to

the claimed apparatus regardless of whether or not Eldredge discloses means for breaking down ozone and vertically spaced conveyor belts.

The claimed apparatus includes arrangements of elements that are distinguishable from those in the cited art with regard to several aspects: creation of a free radical saturated atmosphere and decomposition of reaction products for further free radical saturation; arrangement of conveyor belts within the claimed apparatus; and negative pressure maintained within the claimed apparatus.

The first difference is found in the creation of a free radical saturated atmosphere and decomposition of reaction products for further free radical saturation. In Eldredge, a “free radical saturated atmosphere” is created within a creation chamber by humidifying a mixture of oxygen and ozone and irradiating the humidified mixture of oxygen and ozone with UV light. The resulting gas is then moved from the creation chamber to a contact chamber wherein it is placed into contact with material to be sterilized. *See* abstract and Figure 1A.

Breakdown/decomposition of reactants created in the process of making the sterilant gas or of the sterilant gas itself is never mentioned. This is vastly different from the claimed apparatus in which sprayheads arranged within the apparatus create and breakdown the free radical saturated atmosphere in the presence of the material (produce) to be sterilized/decontaminated. *See* paragraph [0027] of the published application. Although Potember does disclose creation/breakdown of a free radical atmosphere in the presence of material to be sterilized/decontaminated, he discloses only a single solid support coated with an ozone removal catalyst. *See* paragraphs [0025] and [0042] of Potember. Thus, the arrangement of sprayheads, as in the claimed apparatus (claim 30), can not be found in the teachings of Potember or any other prior art.

The Examiner asserts that Eary discloses hydrogen peroxide decomposition in acidic solutions catalyzed by the free ferric ion,  $\text{Fe}^{+3}$ . Applicant does not dispute that Eary discloses such a reaction, however this reaction is not the ozonized water and ferrous  $\text{Fe}^{+2}$  solution reaction that is carried out within the chamber of the claimed apparatus. Prior to the instant inventor, no one had applied this type of reaction in a produce decontamination apparatus. *See*

paragraph [0024] of the published application. Thus, Eary is not relevant to the claimed invention.

Another difference is the arrangement of conveyor belts in the chamber of the claimed apparatus. Eldredge describes the use of a conveyor system for sterilization of agricultural products in which the products are sprayed with the sterilizing agent as the products move down a horizontal conveyor belt. *See* page 28, lines 1-14. No conveyor arrangement other than the conventional horizontal conveyor is discussed. Kamm discloses a vertical circulating conveyor system (paternoster conveying principle). *See* abstract; column 1, lines 30-40; column 5, lines 15-57; and Figure 1. Neither use of horizontal conveyor belts nor multiple conveyor belts is disclosed. In stark contrast to the conveyor systems of the cited art, in the claimed apparatus, produce is dropped through the chamber from an upper to a lower conveyor belt. *See* paragraphs [0011] and [0027]-[0029]. This enables the produce to be fully exposed to the ozonized liquid spray without the provision of further mechanical means and also results in a tumbling motion which alters the orientation of the produce thereby ensuring that the area of the produce that was masked from the cleaning atmosphere on the upper conveyor belt is exposed on the lower conveyor belt. This arrangement of conveyor belts can not be found in the teachings of the prior art.

A further difference is the pressure maintained within the substantially enclosed chamber of the claimed apparatus. In order to ensure that the free radical saturated atmosphere does not leak out into the general environment in which the apparatus is placed, the pumped chamber exhaust **18** generates a negative pressure within the chamber **10** by recirculating a portion of the free radical saturated atmosphere (circulation direction indicated by arrow C) and promoting the ingress of ambient air through air inlet **16** (air flow direction indicated by arrow D). *See* paragraph [0026] and the Figure. Additionally, recirculation reduces the need for replenishment of the system. The prior art mentions neither a chamber exhaust nor a negative pressure environment.

Based upon the above-discussed aspects, it is clear that the elements and/or the arrangement of the elements in the claimed apparatus are not equivalent to those elements and/or



arrangements of elements in the apparatuses of the cited prior art. Accordingly, Applicant respectfully submits that the Examiner has failed to provide a convincing showing that all the elements and/or arrangement of elements of the apparatus, as currently claimed, are taught/disclosed in the prior art.

Considering that all of the elements of the apparatus are not found in the cited art (Eldredge, Eary, Potember, Singh, and Kamm), combination of this cited art would not produce the claimed apparatus. Even if the cited references (Eldredge, Eary, Potember, Singh, and Kamm) were combinable to produce the claimed apparatus, a simple teaching of elements is insufficient. In order to establish a proper *prima facie* case of obviousness, the prior art must also suggest the desirability of the claimed invention and/or give some reason for references to be combined.

Obviousness can be established by combining or modifying teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. *In re Kahn*, 441 F.3d 977, 986, 78 USPQ2d 1329, 1335 (Fed. Cir. 2006); *see* MPEP 2143.01 I.

Therefore, in order for an Examiner to properly establish a *prima facie* case of obviousness, the Examiner must not only show that all elements of the claimed invention are known or suggested in the prior art, but must also show that one of ordinary skill in the art would have some reason or motivation to put all the elements together to achieve the claimed invention.

For the purpose of refuting the combinability of the references, suppose that one does believe that the combination (Eldredge and Eary with Potember, Singh, and/or Kamm) teaches all elements of the invention, why would one of ordinary skill in the art consider these references to be related and/or combinable in the first place? Furthermore, why would one find it advantageous to combine these elements?

First, with regard to the combination of Eldredge and Eary, as disclosed above, Eary concerns reactions in an acidic solution. An acidic environment (within the chamber) would not be a characteristic which one would aspire to achieve whilst attempting to construct a chamber as in the claimed apparatus. Thus, one of ordinary skill in the art would find these references unrelated (Eldredge and Eary) and would not think of combining their teachings.

Even if an Examiner only relies on portions of a reference to support his/her rejection, an Applicant may use the entire disclosure of a reference to refute the rejection. *See* MPEP 2141.02 VI.

The technology used by Potember is based on the formation of highly reactive ozone intermediates that form when ozone reacts with water vapor in the presence of ultraviolet light inside a flow-through reaction chamber into which contaminated air is introduced. Thus, operation of Potember's apparatus is dependent upon the presence of a water supply line. *See* paragraphs [0013]; [0014]; and [0016] and Figure 1 of Potember. In contrast, the claimed apparatus does not require a water supply line. Furthermore, the application suggests that extensive use of water is an undesirable characteristic in techniques of decontamination. *See* paragraph [0004] of the published application. Thus, if one of ordinary skill in the art were trying to develop a water supply-free method of decontamination, one would certainly not consider methods, such as that of Potember, which are dependent upon presence of a water supply.

This concept may also be viewed in terms of function. For example, if a proposed modification would render the prior art invention unsatisfactory for its intended purpose, then there is no suggestion to make the proposed modification. *See* MPEP 2143.01 V. Considering that the apparatus of Potember is dependent upon a water supply line, any combination with systems lacking a water supply line, such as the claimed apparatus, would render the apparatus (of Potember) nonfunctional. Thus, there is no suggestion/motivation for one of ordinary skill in the art to attempt to devise the claimed apparatus from the disclosure of Potember.

The Examiner states that Eldredge discloses use of a conveyor system and relies on Kamm to teach two conveyor belts (**4**, **5**) and adjustable vertical space between the conveyor belts.

Applicant disagrees and respectfully submits that the Examiner is incorrect regarding the teachings of Kamm. The conveying system of Kamm is designed according to the paternoster conveying principle. Thus, there is only one circulating conveyor belt and not two as asserted by the Examiner. *See* abstract and column 4, lines 38-45 of Kamm. Elements **4** and **5** are disclosed

and shown by Kamm to be lifting devices, *i.e.* mechanical means for lifting and lowering such as a linear drive, hydraulic means, or a crank-driving mechanism. *See* column 2, lines 32-37; column 5, lines 15-26; and Figure 1 of Kamm.

Considering all of the above, one of ordinary skill in the art would realize that the cited references are not related in any significant manner to each other or to the claimed invention. One of ordinary skill in the art would not see any advantage for combining Eldredge and Eary with Potember, Singh, and/or Kamm and would have no reasonable basis for such combining. Thus, Applicant respectfully submits that the Examiner has not only failed to show that all elements of the claimed invention are known or suggested in the art, the Examiner has also failed to show that one of ordinary skill in the art would have some reason or motivation to put all the elements together to achieve the claimed invention even if all of the elements were known. Accordingly, a proper *prima facie* case of obviousness has not been established.

As noted above, independent claims 15 and 30 recite, *inter alia*, a produce decontamination apparatus having a substantially enclosed chamber for accepting produce which is maintained at a negative pressure, an arrangement of sprayheads for creating the free radical saturated atmosphere and breakdown of reactants produced providing further free radical saturation, and a unique arrangement of conveyor belts which create a flow path for the produce wherein all surfaces (of the produce) can be in contact with the free radical saturated atmosphere within the chamber.

Based upon all of the above arguments, neither the cited references (Eldredge, Eary, Potember, Singh, and Kamm) nor any other prior art teach or suggest a produce decontamination apparatus as currently claimed. Accordingly, Applicant respectfully submits that claims 15 and 30 are patentable over Eldredge and Eary in view of Potember, Singh, and/or Kamm. As claims 17-20 and 25-29 depend from claim 15 and claims 31-37 depend from claim 30, these dependent claims necessarily include all of the elements of their base claim. Thus, Applicant respectfully submits that these dependent claims are allowable over Eldredge and Eary in view of Potember, Singh, and/or Kamm for at least the same reasons.

In light of all the foregoing, Applicant respectfully requests reconsideration and

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withdrawal of this rejection under 35 U.S.C. §103(a).

### Conclusion

In light of the foregoing amendments and remarks this application is now in condition for allowance and early passage of this case to issue is respectfully requested. If any questions remain regarding this response or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned. The fee for a request for continued examination pursuant to 37 C.F.R. §1.17(e) in the amount of \$405 and the fee for a two month extension of time pursuant to 37 C.F.R. §1.17(a)(2) in the amount of \$245 are believed to be due and are being paid via credit card. No other fees are believed to be due at this time. However, please charge any other fee required (or credit any overpayment) to the Deposit Account of the undersigned, Account No. 500601 (Docket No. 7043-X06-002).

Respectfully submitted,  
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